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MUSKELLUNGE CREEL SURVEY
ON CALDRON FALLS FLOWAGE,
MARINETTE COUNTY, WISCONSIN
1982-83

By
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ABSTRACT

A random, stratified creel survey took place on Caldron Falls Flowage -- a Class-A muskellunge (Esox masquinongy) fishery in Marinette County, Wisconsin -- during the 1982 and 1983 open-water and the 1983-84 ice-fishing seasons. The survey showed averages of almost 5,000 muskellunge-fishing trips annually and a 120-muskellunge/year harvest. The estimated 30% annual exploitation rate for 1982 is below the 36% maximum level in Wisconsin's long-range muskellunge plan. However, fishing pressures for the 1982 vs. 1983 open-water seasons differed by more than 20,000 angler hours, with a 66,036-hour mean. Overall, anglers averaged 75 hours to catch a legal-sized muskellunge, then released more than 40% of those caught. Such voluntary release of legal-sized muskellunge may be more effective at curbing the harvest on Caldron Falls Flowage than increased size limits and shortened seasons. I recommend promoting catch and release among anglers, using maxillary clips and fin clips to mark stocked muskellunge, and conducting another creel survey on Caldron Falls Flowage during 1991-92.

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INTRODUCTION

The muskellunge (Esox masquinongy) grows to more than 50 inches. This large, lone predator has characteristically low population densities in Wisconsin (Oehmcke 1969).

Caldron Falls Flowage is the only Class-A muskellunge fishery in WDNR's Lake Michigan District. The flowage contained an estimated 306 muskellunge, 30 inches or longer, during a 1982 survey (Kornely, Wis. Dep. Nat. Resour., unpublished data).

Muskellunge have been stocked in Caldron Falls Flowage since 1957 (Table 1), originally to balance panfish populations as well as to provide anglers with a large gamefish. The 1982 survey found panfish populations little changed by muskellunge stocking.

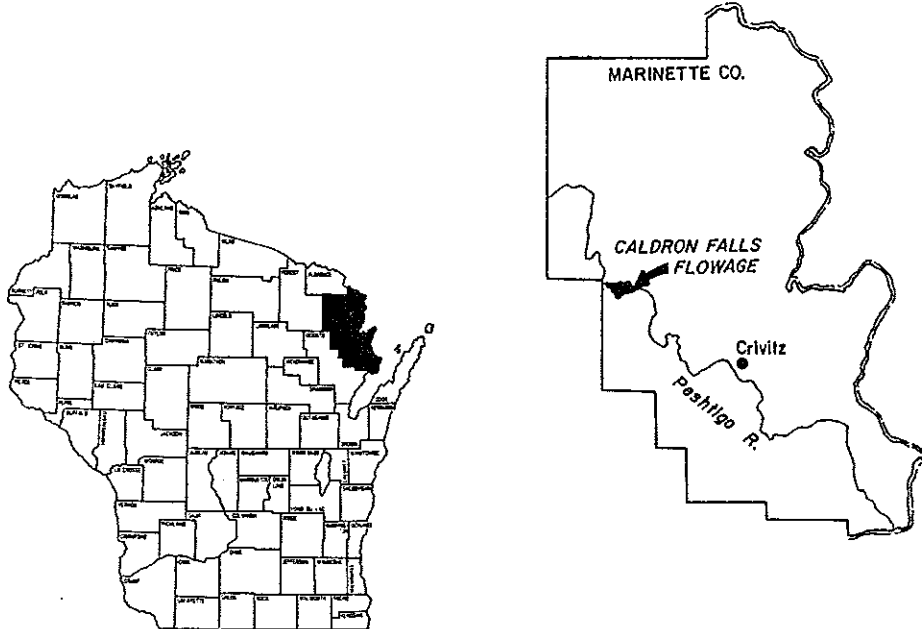
Now, as angler demand for muskellunge increases, so does concern about overharvest. This study attempts to determine muskellunge harvest on Caldron Falls Flowage and to assess management of that increasingly popular fishery.

Table 1. Muskellunge stocking in Caldron Falls Flowage.

Year	Month/s	Fish Stocked		Marking*
		#	Size	
1957	Jul	1,960	fingerlings	--
1959	Jul	13,000	fingerlings	--
1960	Jul-Aug	2,025	fingerlings	--
1961	Jun	400	yearlings	--
1962	Apr	400	yearlings	--
1963	Oct	800	fingerlings	--
1964	Jul	3,000	fingerlings	--
1965	Aug-Sep	4,650	fingerlings	--
1970	Aug	2,838	fingerlings	LP clip
1974	Aug	2,500	fingerlings	RP clip
1975	Sep	2,000	fingerlings	LP clip
1976	Aug	2,000	fingerlings	RV clip
1977	Aug	2,000	fingerlings	RP clip
1978	Aug	2,000	fingerlings	RM clip
1979	Aug	2,000	fingerlings	LV clip
1980	Jul	2,000	fingerlings	RV clip
1982	Sep	835	fingerlings	LV clip
1983	Oct	2,047	fingerlings	RV clip

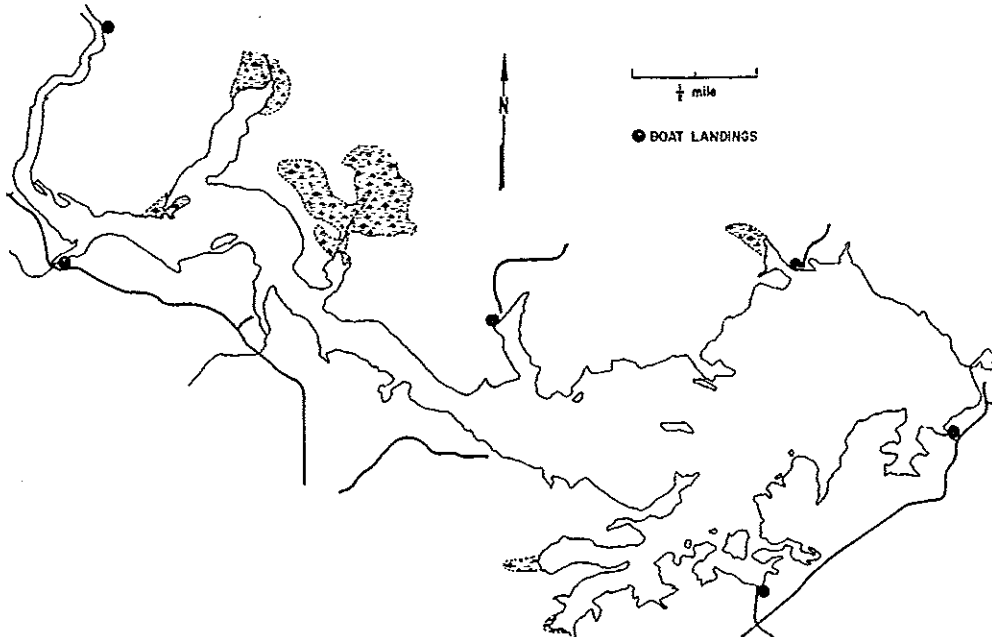
* LP = left preopercle, RP = right preopercle, LV = left ventral, RV = right ventral.

STUDY AREA



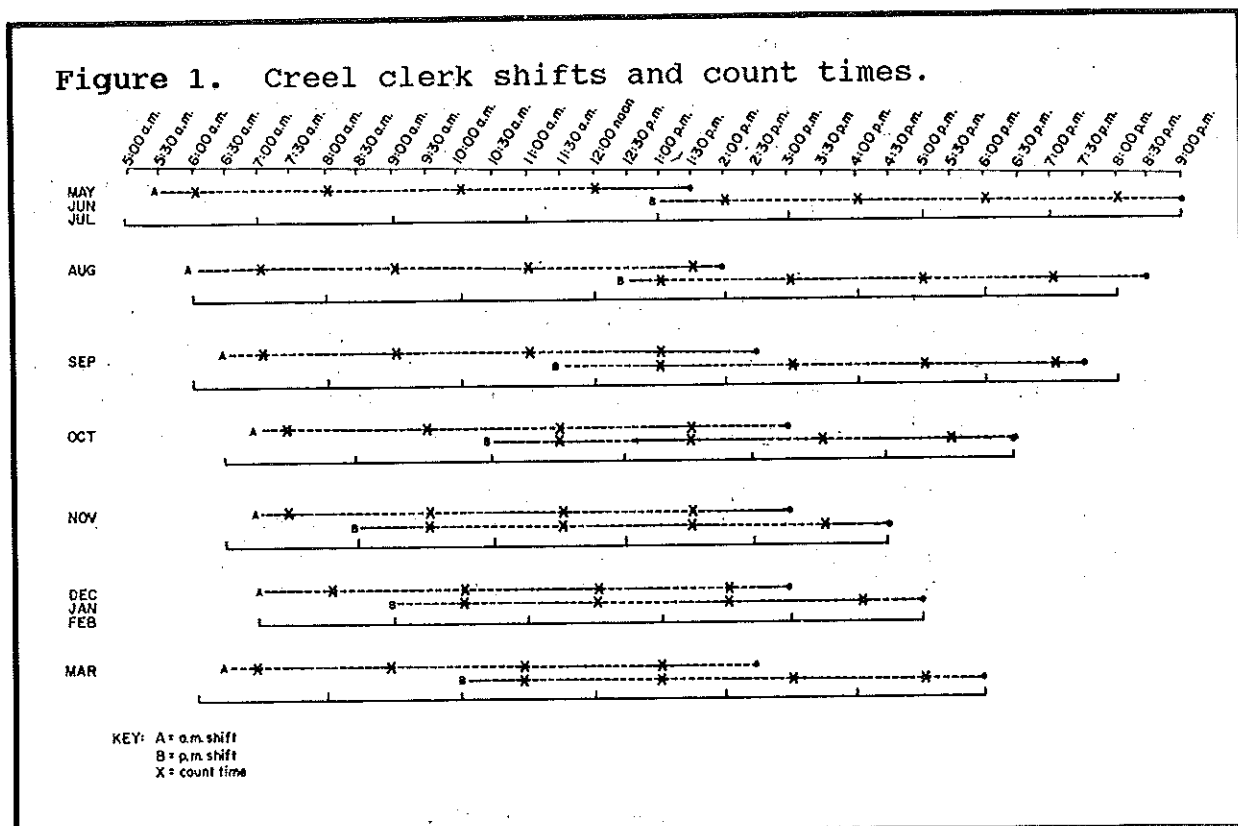
Caldron Falls Flowage is a 1,018-acre impoundment on the Peshtigo River, 20 miles northwest of Crivitz, Wisconsin, in Marinette County. While 10% of the flowage is less than 3 ft deep, 26% is more than 20 ft deep with a maximum depth of 40 ft.

The Wisconsin Public Service Corporation (WPSC) has operated an 80-ft head hydroelectric dam on the flowage since 1924. WPSC owns the entire 21-mile shoreline, which with the exception of six well maintained boat landings is undeveloped and forested.



METHODS

A random, stratified creel survey took place on Caldron Falls Flowage during the 1982 and 1983 muskellunge seasons (from the first Saturday of May through 30 November each year) and also during the 1983-84 ice-fishing season (11 December -- 30 March). Spanning sunrise to sunset, each survey day had two 8-hour, creel-clerk shifts (Lambou 1961). Daylight hours determined when the shifts began and ended, and how much they overlapped (Fig. 1). Methods used in this census follow those described by Lambou (1961).



Creel clerks worked an a.m. or p.m. shift each weekend day and alternated shifts on three randomly selected weekdays. At 2-hour intervals, clerks took 30-40 minutes to motorboat around the flowage and count anglers. Between counts, they interviewed anglers for information about fishing methods, species and lengths of fish caught, duration of the fishing trip, residence, age, and so on. When clerks interviewed anglers more than once on the same day, only new information was recorded. At the ends of shifts, clerks visited any one of the six boat landings at random to ask departing anglers about completed fishing trips.

During the ice-fishing season, clerks used similar procedures -- substituting a snowmobile or three-wheeler to make angler counts on the ice and conducting completed-trip interviews as anglers left the ice.

In 1982, angler interviews were recorded on Interview Form 3600-114 for computer analysis (Appendix A). Beginning in 1983, clerks used programmable calculators to record and tabulate interviews, which proved effective and timesaving -- but did not break down angler effort by species sought (Appendix B).

Average daily fishing pressure was calculated by multiplying the average number of anglers per count by the 2 hours between counts by the 4 counts per eight-hour shift. Total fishing pressure each month was then calculated by multiplying the average daily pressure by the number of days in the month. Separate estimates for weekdays and weekends/holidays were combined in the monthly totals.

Harvest values were also calculated for each month. Harvest rate calculations included total catch figures divided by total hours anglers had fished, whether or not a fishing trip was completed at the time of an interview. Total harvest was then determined by multiplying the harvest rate by estimated fishing pressure.

All harvested gamefish, and many panfish, were measured to the nearest 0.1 inch to determine monthly length frequencies. In 1982, a supplemental record was kept, indicating if the legal-sized muskellunge caught were kept or released.

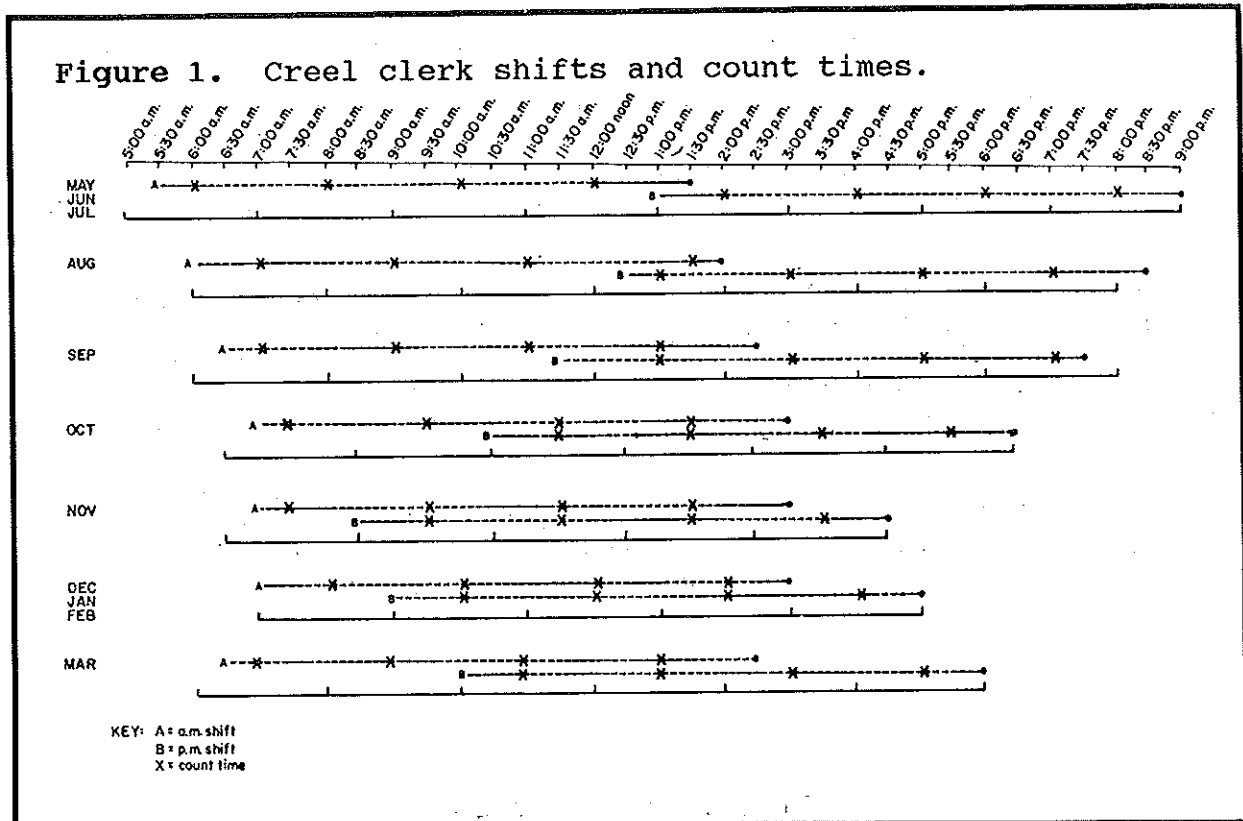
RESULTS AND DISCUSSION

FISHING PRESSURE

Open-water anglers on Caldron Falls Flowage fished an estimated 76,298 hours (74.9 hours/acre) in 1982 and 55,774 hours (54.8 hours/acre) in 1983 (Table 2). The large decrease in 1983 was probably due to weather. May 1983, for example, was colder, wetter, and windier than May 1982, and in that month alone anglers fished an estimated 10,000 hours less in 1983. The average fishing pressure for both years was 66,036 hours (64.9 hours/acre).

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Table 2. Fishing pressure on Caldron Falls Flowage in estimated angler hours.

Month	Open-Water Fishing			Ice-fishing
	1982	1983	Average*	1983-84
May	16,608	6,486	11,547	--
Jun	16,897	12,707	14,802	--
Jul	20,995	15,320	18,157	--
Aug	13,664	9,953	11,809	--
Sep	6,287	8,215	7,251	--
Oct	1,759	2,908	2,333	--
Nov	88	185	137	--
Dec	--	--	--	745
Jan	--	--	--	6,084
Feb	--	--	--	4,984
Mar	--	--	--	3,162
Total	76,298	55,774	66,036	14,975
hours/acre			64.9	14.7

* Averages for total survey period were 81,011 angler hours and 79.6 hours/acre.

During the 1983-84 ice-fishing season, anglers fished 14,975 hours (14.7 hours/acre) -- 18% of total fishing pressure. Ice-fishing pressure and average open-water fishing pressure combined were 81,011 angler hours (79.6 angler hours/acre). This estimate does not account for fishing after dark, which is believed to be insignificant, or fishing in April, the usual month of ice breakup on the flowage.

Fishing pressure on Caldron Falls Flowage was within the range of that on other lakes in northeastern Wisconsin (Table 3).

Table 3. Fishing pressure and harvest rates on several lakes in northeastern Wisconsin.

Lake	County	Time Period	Acres	Angler Hours/Acre	Fish No./Hour	Reference
Caldron Falls Flowage	Marinette	May-Nov (2 years)	1,018	65	0.85	Current Study
		Dec-Mar (1 year)		15	1.13	Current Study
Bass Lake	Oconto	Dec-Sep (1 year)	142	49	1.13	Heizer, pers. comm. 1985
Boot Lake	Oconto	Dec-Sep (1 year)	235	100	.78	Heizer, pers. comm. 1985
High Falls Flowage	Marinette	Dec-Apr (1 year)	1,498	7	.66	Heizer, pers. comm. 1985
Noquebay	Marinette	May-Sep (1 year)	2,409	34	1.28	Thuenler 1981
		Dec-Apr (1 year)		13	.65	Thuenler 1982
Shawano	Shawano	June-May (1 year)	6,178	73	1.09	Langhurst 1982

Seasonally, the greatest open-water fishing pressure occurred during July in both 1982 and 1983; the least was during November, when average fishing pressure was only 0.2% of the total. The greatest fishing pressure during ice-fishing season occurred in January. Overall, fishing pressure was greatest at midday (10:00 a.m. - 2:00 p.m.) and on weekends (55% of the total).

The mean number of anglers fishing at any time was 27 in 1982, 22 in 1983, and 14 in 1983-84. October and November were excluded from the 1982 and 1983 data because of the generally low fishing pressure during these two months. The highest angler count during the entire study was on 29 May 1982 (Memorial Day weekend) -- 238 anglers. The highest count during 1983 was 150, and during the 1983-84 ice-fishing season the highest count was 107 anglers.

In 1982, 26% of anglers interviewed reported they were fishing at least in part for muskellunge (Table 4), yielding an estimated 19,837 angler hours expended on muskellunge. Angler hours by species were not determined in 1983.

Table 4. 1982 muskellunge catch and harvest statistics on Caldron Falls Flowage.

Month	Total No. Anglers	Anglers Fishing No.	Muskellunge % Hours spent	Muskellunge Caught	Catch Rate Fish/Hour	Muskellunge Kept	Harvest Fish/Hour	
May	949	150	16	357	7	0.0196	3	0.0084
Jun	935	208	22	459	10	0.0218	4	0.0087
Jul	1,126	235	21	425	8	0.0188	3	0.0071
Aug	671	156	23	366	12	0.0328	3	0.0082
Sep	463	210	45	544	8	0.0147	4	0.0074
Oct	219	149	68	220	9	0.0409	2	0.0091
Nov	11	11	100	36	1	0.0278	0	0
Total/ Average	4,374	1,119	26	2,407	55	0.0237	19	0.0079

HARVEST

Unless otherwise specified, harvest information refers to average total annual harvest, determined by adding the average 1982 and 1983 open-water harvest to the 1983-84 ice-fishing harvest.

All Species

Total annual harvest from Caldron Falls Flowage was estimated at 73,308 fish (72 fish/acre), or 3 fish/fishing trip (Table 5). This harvest estimate does not include caught-and-released fish.

Panfish made up 97% of the total annual harvest. Species composition was: 40% yellow perch, 29% bluegill, 27% black crappies, and 4% rock bass and pumpkinseed. Most yellow perch and bluegill were caught during open-water season, but black crappie harvest was similar during open-water and ice-fishing seasons.

The remaining 3% of total harvest was gamefish: 59% largemouth bass, 34% northern pike, and 7% muskellunge. Open season for largemouth bass and northern pike extended through 1 March. Almost all largemouth bass were taken during open-water season, but northern pike were caught in equal numbers during open-water and ice-fishing seasons.

Table 5. Estimated number of fish harvested from Caldron Falls Flowage.

Species	May-Nov 1982	May-Nov 1983	Average 1982-83	Dec 1983- Mar 1984	Annual Average	Percentage of Total Harvest
Panfish						
Yellow Perch	19,999	23,499	21,749	6,815	28,564	40.0
Bluegill	20,678	19,689	20,542	358	20,184	28.8
Black Crappie	12,462	7,909	10,186	9,387	19,573	27.4
Rock Bass	1,508	2,171	1,840	59	1,899	2.7
Pumpkinseed	1,358	370	864	4	868	1.1
Total	56,005	53,638	54,822	16,623	71,446	100.0
Gamefish						
Largemouth Bass	1,410	802	1,106	4	1,110	59.6
Northern Pike	390	204	297	331	628	33.7
Muskellunge	141	99	120	4	124	6.7
Total	1,941	1,105	1,523	339	1,862	100.0

Anglers kept 95% of all fish caught during the ice-fishing season but only 68% of those caught during the open-water season. The average size of each species harvested was similar from year to year and season to season (Table 6).

Table 6. Mean lengths of fish to the nearest 0.1 inch harvested from Caldron Falls Flowage. (The number of fish measured is in parentheses.)

Species	May-Nov '82	May-Nov '83	Dec '83-Mar '84
Yellow perch	6.5 (307)	6.3 (559)	6.3 (676)
Bluegill	6.1 (554)	6.2 (374)	6.2 (45)
Black crappie	7.3 (278)	7.4 (232)	7.6 (1,327)
Rock bass	6.9 (52)	7.0 (69)	7.6 (11)
Pumpkinseed	5.6 (34)	5.8 (28)	5.8 (1)
Largemouth bass	11.7 (181)	12.7 (90)	--
Northern pike	22.5 (53)	22.7 (30)	24.0 (79)
Muskellunge	33.9 (19)	34.3 (12)	--

Muskellunge

An important consideration in any muskellunge study is the typically low population densities of these solitary, predaceous fish. Estimates based on expansion of interview data will thus have wide confidence margins, since adding or subtracting a single fish can significantly change estimated numbers.

Totals of 398 and 282 muskellunge were caught, but not necessarily harvested, in 1982 and 1983, respectively (Table 7). Catch and harvest rates varied by month within each year as well as between the two years. In 1982, anglers harvested the most muskellunge in June, but caught the most in August. In 1983, however, the highest catch and harvest were in May. Based on the seasonal average for both study years, the highest muskellunge harvest by percent occurred in May (32%), followed by June (20%) and August (18%).

Table 7. Muskellunge Catch and Harvest by Number and Rate from Caldron Falls Flowage.

Month	1982		1983		Average	
	No. Fish /Hour		No. Fish /Hour		No. Fish /Hour	
May						
Catch	55	0.0033	72	0.0047	64	0.0040
Harvest	23	0.0014	54	0.0035	39	0.0025
Jun						
Catch	86	0.0056	51	0.0040	69	0.0048
Harvest	34	0.0020	13	0.0010	24	0.0015
Jul						
Catch	55	0.0026	40	0.0026	48	0.0026
Harvest	23	0.0011	0	0	12	0.0006
Aug						
Catch	105	0.0077	47	0.0047	76	0.0062
Harvest	26	0.0019	17	0.0017	22	0.0018
Sep						
Catch	48	0.0077	48	0.0059	48	0.0068
Harvest	24	0.0038	10	0.0012	17	0.0025
Oct						
Catch	47	0.0268	22	0.0075	35	0.0172
Harvest	11	0.0060	5	0.0019	8	0.0040
Nov						
Catch	2	0.0281	2	0.0098	2	0.0190
Harvest	--	0	--	0	--	0
Total						
Catch	398	0.0060	282	0.0047	340	0.0053
Harvest	141	0.0021	99	0.0013	120	0.0017

Anglers harvested an estimated 141 muskellunge from Caldron Falls Flowage in 1982, and 99 muskellunge in 1983. This harvest was 1 fish/7.2 acres in 1982 and 1 fish/10.2 acres in 1983. The statewide average muskellunge harvest is 1 fish/5.6 acres of water (Oehmcke et al. 1977).

Creel clerks recorded 1 illegal muskellunge harvested during the 1983-84 ice-fishing season, resulting in an estimated total illegal harvest of 4 muskellunge. Few muskellunge are believed to be caught through the ice on Caldron Falls Flowage.

The population of muskellunge 30 inches or larger in Caldron Falls Flowage during 1982 was 521, with a 95% confidence limit of 129-914 fish. Of the 79 legal-sized muskellunge marked with preopercle metal tags just before the survey began, 4 were harvested by surveyed anglers. Calculations followed Baily's modification ($M=79$, $C=32$, $R=4$) of the Peterson estimate (Ricker 1958). Thus the population density of legal muskellunge was 1 fish/2 acres of water.

The tagged fish further showed that muskellunge move out of Caldron Falls Flowage. In 1984, a tagged 42-inch muskellunge was caught 6 miles upstream from the flowage in the Peshtigo River. The same year, a tagged 34-inch muskellunge was caught below the Caldron Falls Flowage dam in High Falls Flowage. Downstream movement of muskellunge was also found in Murphy Flowage (Margenau and Snow 1984). The extent of muskellunge movements, however, is not known.

The annual exploitation rate of muskellunge in Caldron Falls Flowage was 30% in 1982, estimated by the percentage of marked fish recovered by anglers the year after marking (Kempinger et al. 1975). It was estimated that 24 of the 79 legal muskellunge tagged in Caldron Falls Flowage in 1982 were harvested later that year. The harvest rate was estimated by expanding the harvest of 3 tagged muskellunge recorded by creel clerks in 1982.

The average annual return to creel for muskellunge stocked in Caldron Falls Flowage was 6%, based on an average annual harvest of 120 (1982 and 1983 average) and an average annual stocking rate of 2,000 fingerlings. This figure does not take into account harvest of naturally reproduced fish. In comparison, Hacker (1973) found an 8% average return of stocked muskellunge on Little Green Lake during a 10-year voluntary creel survey.

A primary factor controlling muskellunge harvest on Caldron Falls Flowage is the size limit for legal harvest: 30 inches in 1982 and 32 inches in 1983. The largest muskellunge reported caught during this survey was 47 inches.

In 1982, there were 32 legal muskellunge among the 55 recorded caught (58%). Of the 32 legal fish, 19 were kept and 13 were released (Table 8). Those kept were 30-39 inches, averaging 33.9 inches. Since 7 of the 19 fish harvested were 30-32 inches, the 1982 harvest would have been reduced by 37% had the 32-inch size limit been in force that year.

Table 8. Legal-sized muskellunge catch-and-release data (percent of catch in parentheses) from 1982 on Caldron Falls Flowage.

Count	> 30 inches		> 32 Inches	
	No. Kept	Released	No. Kept	Released
Recorded*	19 (59)	13 (41)	11 (55)	9 (45)
Recorded and Reported**	47 (57)	36 (43)	38 (54)	32 (46)

* Muskellunge recorded by creel clerk on duty. If not measured by the clerk, the length reported by the angler was recorded.

**Muskellunge recorded by creel clerk on duty and also those reported at other times.

In 1983, when the size limit was increased to 32 inches, there were 44 muskellunge recorded caught, of which 12 were kept. The 12 muskellunge harvested were 32-36.4 inches, averaging 34.3 inches. The number of legal-sized muskellunge caught and released was not recorded that year.

One benefit of the 32-inch size limit is that female muskellunge will have a greater chance to reach maturity and spawn. In 1982, all mature females captured were 6 years old or older, and the average size of 6-year-old females was 32.3 inches (Kornely, Wis. Dept. Nat. Resour., unpubl. data). Thus, more first-year female spawners are protected by the 32-inch limit.

A second factor expected to limit muskellunge harvest is the shorter muskellunge season in 1984. For all inland waters north of U.S. Highway 10, opening day was changed from the first to the last Saturday in May. In 1982, 16% of the muskellunge harvested were taken in May, and in 1983 54% were taken in May. The extent to which harvest is reduced by the shortened season will vary from year to year and may be partially offset by increased angler pressure during the rest of the season.

In addition to size and season restrictions, a third factor controlling muskellunge harvest on Caldron Falls Flowage is the voluntary catch-and-release program initiated by anglers. The degree to which the 1983 size-limit increase contributed to a lower harvest was obscured by a high rate of catch and release of legal muskellunge. According to the reports and creel clerk records, muskellunge anglers released more than 40% of their legal catch in 1982.

Porter (1977) reported that among the more effective means of ensuring the availability of trophy muskellunge is for anglers to release all muskellunge of non-mounting size. Organizations such as Muskies, Inc. help to encourage this practice by giving special recognition to members who release legal fish. However, voluntary release rates of muskellunge vary greatly among lakes. For example, a 74% release rate was reported for Bone Lake, in northwestern Wisconsin (R. Cornelius, Wis. Dept. Nat. Resour., pers. comm. 1982), which contrasts with a much lower 15% rate reported for Lake Winter, also in northwestern Wisconsin (F. Pratt Jr., Wis. Dept. Nat. Resour., pers. comm. 1982).

CATCH AND HARVEST RATES

Harvest rates of gamefish were lower in 1983 than in 1982, but overall panfish harvest rates increased (Table 9). These harvest rates, in conjunction with a 27% decrease in total fishing pressure from 1982 to 1983, resulted in a 43% reduction in gamefish harvest and a 4% increase in panfish harvest. Fishing pressure, therefore, was not the sole determinant of harvest. Standing crop of available fish and the state of the natural food supply, which influenced annual harvest on Escanaba Lake (Kempinger et al. 1975), may also have affected harvest and harvest rates on Caldron Falls Flowage.

Table 9. Catch and harvest rates for principle species in Caldron Falls Flowage.

Species	<u>1982 Rates</u>		<u>1983 Rates</u>	
	Catch	Harvest	Catch	Harvest
Northern Pike	.0123	.0053	.0082	.0036
Largemouth Bass	.0389	.0188	.0228	.0112
Bluegill	.5346	.2766	.3684	.3083
Yellow Perch	.4714	.2758	.4757	.3837
Black Crappie	.1826	.1691	.1256	.1106

In 1982, catch and harvest rates were computed for muskellunge angling hours. The muskellunge catch rate was .0237 fish/hour; thus, it took the average muskellunge angler 44 hours to catch a muskellunge. The harvest rate was .0079 fish/hour or 126 angler hours per harvested fish. However, the number of angler hours expended to catch a legal muskellunge, after accounting for the rate of catch and release, was 75.

ANGLER CHARACTERISTICS

During the open-water season, creel clerks interviewed 4,374 anglers in 1982 and 3,397 in 1983; during the 1983-84 ice-fishing season 1,812 anglers were interviewed (Table 10). Nearly all the open-water and ice-fishing anglers on the flowage were Wisconsin residents. Open-water anglers tended to travel greater distances to fish Caldron Falls Flowage than ice anglers. Overall, anglers took an annual average of 24,102 fishing trips.

Table 10. Characteristics of anglers surveyed on Caldron Falls Flowage.

Angler Characteristic	May-Nov 1982	May-Nov 1983	Dec-Mar 1983-84
Total No. Interviewed	4,374	3,397	1,812
Hours of Fishing	9,235	9,387	3,853
Fishing Location			
Boat (%)	99	96	--
Shore (%)	1	4	--
Average Length (hours) of Completed Trips	3.8	3.2	2.8
No. of Completed Trips	859	977	111
Wisconsin Residents (%)	95	95	97
Distance Travelled			
< 26 miles (%)	7	10	50
26-50 miles (%)	3	5	39
> 50 miles (%)	90	85	11
Gender			
Male (%)	80	80	85
Female (%)	20	20	15
Mean No. of Anglers/Count	27*	14*	--
No. of Fishing Trips	20,078	17,429	5,348

* October and November counts excluded.

MANAGEMENT RECOMMENDATIONS

I recommend the following:

1. Efforts should be made to encourage catch and release and to educate anglers as to its importance in producing trophy fish.

Present regulations are designed to manage muskellunge as a trophy fish by limiting harvest -- the size limit has been increased from 30 to 32 inches and the season has been shortened. Perhaps more significant are indications that the muskellunge angler perceives the muskellunge as a trophy fish and often imposes a personal size limit that exceeds legal limits. Were it not for the high degree of catch and release of legal-sized muskellunge, the exploitation rate would be considerably higher than 30%. Current regulations and angler attitudes portend a bright future for muskellunge fishing on Caldron Falls Flowage. No further changes in muskellunge fishing regulations are needed at this time.

2. Muskellunge stocked in the future should be marked with both a maxillary clip and a fin clip to enhance recognition.

Marking stocked fish distinguishes them from fish that have naturally reproduced. Beginning in 1970, either a ventral or pectoral fin of all muskellunge stocked in Caldron Falls Flowage was removed -- except in 1978 when a maxillary clip was used. The maxillary clip may have been more effective. Less than 1% of the muskellunge captured in 1982 were completely missing a fin, and 38% showed some degree of regenerated fin deformity and probably had been stocked. The remaining muskellunge captured showed no sign of clipped fins, but some degree of undetectable regeneration was suspected. Therefore, creel clerks were not instructed to look for clips. Also, marking stocked fish is valuable in growth studies for checking the exact age of fish.

3. A creel survey should be conducted again on Caldron Falls Flowage from in 1991 through 1992 to determine exploitation and harvest.

This study illustrates the variation in catch and harvest from one year to the next. It may be important to conduct creel surveys, depending on purpose, through at least two consecutive years, since one year's data is not necessarily representative of the fishery surveyed.

In my 1982 survey report, I recommended discontinuing muskellunge stocking in 1984 and 1985, then resuming in 1986 with 1,000 fingerlings/year instead of 2,000. I also recommended that the flowage be surveyed in 1991 to assess the muskellunge population and, particularly, to look for natural reproduction during the years no fish were stocked.

In 1982, catch and harvest rates were computed for muskellunge angling hours. The muskellunge catch rate was .0237 fish/hour; thus, it took the average muskellunge angler 44 hours to catch a muskellunge. The harvest rate was .0079 fish/hour or 126 angler hours per harvested fish. However, the number of angler hours expended to catch a legal muskellunge, after accounting for the rate of catch and release, was 75.

ANGLER CHARACTERISTICS

During the open-water season, creel clerks interviewed 4,374 anglers in 1982 and 3,397 in 1983; during the 1983-84 ice-fishing season 1,812 anglers were interviewed (Table 10). Nearly all the open-water and ice-fishing anglers on the flowage were Wisconsin residents. Open-water anglers tended to travel greater distances to fish Caldron Falls Flowage than ice anglers. Overall, anglers took an annual average of 24,102 fishing trips.

Table 10. Characteristics of anglers surveyed on Caldron Falls Flowage.

Angler Characteristic	May-Nov 1982	May-Nov 1983	Dec-Mar 1983-84
Total No. Interviewed	4,374	3,397	1,812
Hours of Fishing	9,235	9,387	3,853
Fishing Location			
Boat (%)	99	96	--
Shore (%)	1	4	--
Average Length (hours) of Completed Trips	3.8	3.2	2.8
No. of Completed Trips	859	977	111
Wisconsin Residents (%)	95	95	97
Distance Travelled			
< 26 miles (%)	7	10	50
26-50 miles (%)	3	5	39
> 50 miles (%)	90	85	11
Gender			
Male (%)	80	80	85
Female (%)	20	20	15
Mean No. of Anglers/Count	27*	14*	--
No. of Fishing Trips	20,078	17,429	5,348

* October and November counts excluded.

MANAGEMENT RECOMMENDATIONS

I recommend the following:

1. Efforts should be made to encourage catch and release and to educate anglers as to its importance in producing trophy fish.

Present regulations are designed to manage muskellunge as a trophy fish by limiting harvest -- the size limit has been increased from 30 to 32 inches and the season has been shortened. Perhaps more significant are indications that the muskellunge angler perceives the muskellunge as a trophy fish and often imposes a personal size limit that exceeds legal limits. Were it not for the high degree of catch and release of legal-sized muskellunge, the exploitation rate would be considerably higher than 30%. Current regulations and angler attitudes portend a bright future for muskellunge fishing on Caldron Falls Flowage. No further changes in muskellunge fishing regulations are needed at this time.

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Appendix B. Creel census program design for Hewlett-Packard 41C programmable calculator used by creel clerks on Caldron Falls Flowage during the 1983 open-water and 1983-84 ice-fishing seasons.

Instructions for "Creel Program"

Creel Program

Program: "Creel"

Size: 120

Example:

1. XEQ "Creel" (press EQ, press Alpha, press C,R,E,E,L, press Alpha.)
2. Prompts with "New Day?"
Answer with Y or N.
If Y, prompts with "Sure?"
Answer with Y or N.
If Y, prompts with "Date?"
Answer with (12 14 32). Then prompts with A, B, C or D?
(month - day - year)
If N, prompts with "A, B, C, or D?"
Answer A --
3. Prompts with "Angler a P,D,M?"
Answer: 1. P = angler is a passenger of car.
2. D = angler is a driver of car.
3. M = angler did not arrive in vehicle.
4. Prompts with "Age?"
Enter the age of angler, i.e., 45.
5. Prompts with "Sex? M or F?"
Answer: 1. M = angler is a male.
2. F = angler is a female.
6. Prompts with "Res? U or N?"
Answer: 1. U = angler is a Wisconsin resident.
2. N = angler is from out of state.
7. Prompts with "Distance?"
Enter the distance in miles the angler travelled to reach the body of water.
8. Prompts with "No. in party?"
Enter the number of anglers in the angler's party, i.e., 2.
9. Prompts with "Tackle Type 1, 2, 3?"
The tackle types can be defined for each individual census.
There are 3 choices that can be made, 1, 2 or 3.
Only one choice can be made per angler.
Enter the number that corresponds to the tackle type the angler is using, i.e., 1, 2, or 3).
10. Prompts with "Bait A, L or B?"
Answer - A = angler using artificial bait
- L = angler using live bait.
- B = Angler using a combination of both.
11. Prompts with "Fish From 1,2,3?"
-- refers to where angler was fishing from, i.e., boat, shore, open ice, ice shanty, etc.
-- there are three choices that can be made, 1, 2 or 3.
-- only one choice can be made per angler.
-- the choices are defined by each individual census and may change with seasons (differ between open water and ice fishing).
-- enter the number that corresponds to the method of fishing of the angler, i.e., 1, 2 or 3).

12. Prompts with: "Completed?"

- refers to if angler was completed fishing or not.
- Answer: Y for yes, angler was done fishing.
N, angler is not done fishing.

A.) If Y, then

- Prompts with: "Time Started?"
-- enter in military time when the angler started fishing, i.e., 09:30 = 9:30 A.M.

Prompts with: "Time Ended?"

- enter in military time when the angler ended his fishing trip.
- If time ended is prior to time started, calculator will prompt with time started again.

B.) If N, then

- Prompts with: "Time Started?"
-- enter in military time when the angler started fishing.

Prompts with: "Time Now?"

- enter in military time the time of the interview.
- If time now is prior to time started, calculator will prompt with time started again.

13. Prompts with: "Species?"

- Enter "EIO" if no fish were caught.
- Enter species code if fish were caught:

for bluegill enter W09
for pumpkinseed enter W06
for northern pike enter L02
for walleye enter X22
for largemouth bass enter W12
for yellow perch enter X15
for rock bass enter W04
for black crappie enter W14
for hybrid musky enter L08
for true musky enter L03

- when entering species code, press letter button and then press the yellow shift button before entering each integer portion of the code, i.e., for bluegill, push W, then shift, then 0, then shift, then 9)

- After entering species code, calculator prompts with: "No. caught?"
Enter the total number of bluegills the angler has caught (kept and released), i.e., 15.

- Calculator then prompts with: "No. kept?"

- Enter the total number of bluegills the angler has kept, i.e., 12.

Calculator then prompts with: "Species?"

- If angler has caught any other species of fish, again list code name and continue as above.

- If angler has not caught any other fish, enter "EIO."

14. Prompts with: "A, B, C, OR D?"

- If doing another interview, press "A".
- B = prints out storage registers.
- C = prints contents of registers on cards.
- D = clears all data in registers.

Contents of Storage Registers

Reg.#	Contents	Reg.#	Contents
00	Date	31	# anglers fishing type 1
01	# of interviews	32	# anglers fishing type 2
02	hold passenger info.	33	hold time started
03	# of passengers	34	sum of time for those not thru fishing
04	# of drivers	35	# of anglers completed fishing
05	# not arriving in vehicle	36	hold time started
06	age of angler	37	sum of time for those completed fishing
07	# anglers 65 & over	38	bluegill catch
08	# anglers under 16	39	bluegill harvest
09	# anglers 16-64	40	pumpkinseed catch
10	# of male anglers	41	pumpkinseed harvest
11	# of female anglers	42	northern pike catch
12	# of out of state anglers	43	northern pike harvest
13	# of resident anglers	44	walleye catch
14	distance angler travelled	45	walleye harvest
15	# anglers from over 50 miles	46	largemouth bass catch
16	# anglers from under 26 miles	47	largemouth bass harvest
17	# anglers fr. between 26-50 mi.	48	yellow perch catch
18	# of anglers in party	49	yellow perch harvest
19	# of parties with over 3 anglers	50	rock bass catch
20	# of parties with 1 angler	51	rock bass harvest
21	# of parties with 2 anglers	52	black crappie catch
22	# of parties with 3 anglers	53	black crappie harvest
23	tackle type	54	hybrid musky catch
24	# anglers using tackle type 3	55	hybrid musky harvest
25	# anglers using tackle type 1	56	musky catch
26	# anglers using tackle type 2	57	musky harvest
27	# anglers using both artificial & live bait	58	sum of anglers fishing from type 1
28	# anglers using artificial bait	59	sum of anglers fishing from type 2
29	fishing from 1, 2, 3	60	sum of anglers fishing from type 3
30	# anglers fishing type 3	61	# anglers using live bait

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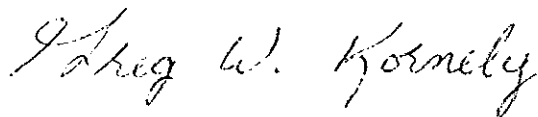
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Currently, I am a WDNR Fisheries Technician. I have a BS-Zoology from the University of Wisconsin-Madison. Since 1978, I have been working with the inland fisheries in the Marinette area, and I have learned much about fisheries from many people during these years. I would like to take this opportunity to single out, in particular, the late Milt Burdick for really starting me off in my fisheries career.



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